

leaves are adequate. For crops requiring petiole analysis, collect at least 15 to 20 petioles.

Submitting the sample

Send the completed information sheet (form AD-4) and the appropriate processing fee with each sample. Use permanent ink or pencil on sample forms and envelopes. Information sheets and sample envelopes are available from local Cooperative Extension offices, agribusinesses, regional agronomists, or the Agronomic Division laboratory.

Pay attention to detail when filling out the information sheet. Supply the information requested in all shaded areas on the form. Note any conditions—drought, disease, injury, pesticide or foliar nutrient applications—that might be relevant.

When identifying the plants that you sampled, give the exact name using the list inside the information sheet, if possible. Give each sample a unique identifier that will help you remember the plants or area it corresponds to—such as HOUSE1, 15B, GOOD, or BAD. You can use up to six letters and/or numbers. Put the identifier on both the information sheet and the sample envelope.

Diagnostic interpretations require more details than predictive. When sending matching soil, solution or waste samples, indicate the matching sample ID in the designated areas on the information sheet. Be sure the grower name and address are exactly the same on all matching information sheets. Ship all matching samples in the same container addressed to the Plant/Waste/Solution Section.

Ship the tissue sample in a paper envelope or cardboard box so it can begin drying during transport. Samples put in plastic bags will rot, and decomposition may alter test results.

Interpreting the report

The lab analyzes samples within two days of their arrival. The prompt turnaround makes it possible for growers to take any corrective action needed to salvage the current crop. The report is immediately posted on the Agronomic Division's Web site and a copy mailed to the grower.

A cover sheet that explains the technical terms and index values accompanies the report. Cover sheets and other information about plant analysis are also available on the Agronomic Division's Web site. Consult an agricultural advisor if you need additional information.

N.C. Department of Agriculture and Consumer Services

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Sampling for Plant Analysis

The Agronomic Division analyzes plant tissue primarily for its nutrient content. It measures all nutrients required for plant growth as well as certain potentially toxic elements. The plant analysis report

- indicates the nutritional status of plants,
- identifies deficiencies and toxicities,
- provides an accounting of nutrient use, and
- provides a mechanism for optimizing yield, quality and efficiency.

Plant analysis assesses nutrient uptake while soil testing predicts nutrient availability. The two tests are complementary as crop management tools, but each has limitations. Plant analysis cannot predict lime requirement. Soil testing is not always a good indicator of nutrients such as nitrogen and sulfur that leach easily. Plant analysis is also a better tool for assessing some micronutrients, such as boron, iron and molybdenum.

Deciding when to sample

To monitor plant nutrient status most effectively, sample during the growth stages recommended for your specific crop (Table 1). Take samples weekly or biweekly during critical periods, depending on management intensity and crop value. However, to identify a specific plant growth problem, take samples whenever you suspect the problem.

Although it is not critical, the best time to collect samples is between mid-morning and mid-afternoon. Nitrate nitrogen levels vary with time of day and prevailing conditions but

generally not enough to alter interpretation. Samples collected during damp weather require extra care to prevent tissue from decomposing during shipping. Keep samples free of soil and other contaminants that can alter results.

Taking a representative sample

Proper sampling is the key to reliable plant analysis results. A sample can represent the status of one plant or 20 acres of plants. In general, a common-sense approach works well.

When problem solving, take samples from both "good" and "bad" areas. Comparison between the two groups of samples helps pinpoint the limiting element. Comparative sampling also

Table 1. Best time to sample when monitoring nutritional status.

- Alfalfa, clover, peanut, pea, soybean:** early bloom
- Apple, cherry, grape, peach, pear, pecan, sweetpotato:** mid-season
- Bean:** early growth and bloom
- Cotton:** from 2 weeks before first bloom through 6 weeks after bloom
- Corn, sorghum, sweet corn:** lay-by and bloom (tasseling)
- Cucumber, squash, tomato:** from 2 weeks before first bloom through fruiting
- Flowering plants & foliage plants:** early growth through bloom
- Irish potato:** early bloom
- Leaf and root crops:** early growth
- Small grain:** full tillering and bloom
- Strawberry:** spring vegetative growth through fruiting
- Tobacco:** early growth through bloom for nutritional status; one week prior to harvest for flue-cured harvest readiness
- Turfgrass:** monthly
- Woody ornamentals:** current year's growth

helps factor out the influence of drought stress, disease, or injury. Take matching soil samples from the root zones of both "good" and "bad" plants for the most complete evaluation.

When monitoring the status of healthy plants, take samples from a uniform area. If the entire field is uniform, one sample can represent a number of acres. If there are variations in soil type, topography, or crop history, take multiple samples so that each unique area is represented by its own sample.

Selecting the best indicator sample

The appropriate part of the plant to sample varies with crop, stage of growth, and purpose of sampling. When sampling seedlings less than 4 inches tall, take whole plants from 1 inch above the soil line. For larger plants, the most recent mature leaf (MRML) is the best indicator sample, except as noted in Table 2.

Table 2. Situations in which the most recent mature leaf (MRML) is *not* the best indicator sample.

- Alfalfa, clover:** early growth through maturity—take top 2 to 3 inches of the plant.
- Corn:** bloom through maturity—take ear leaf.
- Cotton, grape, strawberry:** take both the MRML and petioles.
- Pecan:** take the middle leaflet pair (Figure 1) from the MRML.
- Small grain:** seedling to full tillering—take whole plant; jointing to bloom—take top 2 or 3 leaves; bloom through maturity—take the flag leaf.
- Tobacco:** mature plants—take the third leaf down; flue-cured harvest readiness—take samples by stalk position (upper, middle, lower).
- Turfgrass:** take clippings from mower bag.

The MRML is the first fully expanded leaf below the growing point (Figure 1). It is neither dull from age nor shiny green from immaturity. For some crops, the MRML is a compound leaf. The MRML on soybean and strawberry, for example, is a trifoliate compound leaf: three leaflets comprising one leaf.

For cotton, grape, and strawberry, petioles provide an additional indication of nitrogen status. When sampling these crops, collect MRMLs and their petioles. Detach leaves from petioles in the field to stop the translocation of nutrients. Put petioles in a separate envelope inside the leaf sample container.

Choosing sample size

Laboratory analysis requires less than one gram of tissue. However, a good sample contains enough leaves to represent the area sampled. Therefore, the larger the area is, the larger the sample size needs to be.

Sample size also varies with crop. For crops with large leaves, like tobacco, a sample of six leaves may be adequate. For crops with small leaves, like azalea, a sample of 25 to 30 leaves is more appropriate. For most crops, 8 to 15

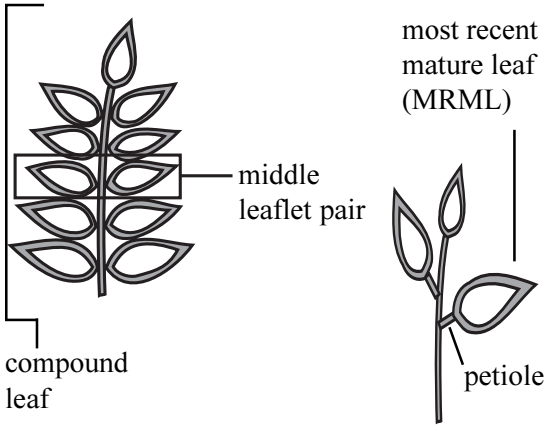


Figure 1. Some best indicator samples.